

## CHAPTER-III

### 3 REVIEW RELATING TO STATUTORY CORPORATION

#### TAMIL NADU ELECTRICITY BOARD

#### PURCHASE OF WIND ENERGY POWER

### HIGHLIGHTS

Tamil Nadu ranks seventh in respect of gross potential and third in respect of technical potential as regards generation of power from wind energy in the country. The Board has been able to develop only 20 sites out of 41 sites identified and declared as potential sites. This resulted in imbalance in the generation and evacuation facilities in some areas.

*(Paragraph 3.1)*

Audit noticed cases of short recovery of Infrastructure Development Charges (Rs.77.56 crore), revenue loss (Rs.204.87 crore) due to non-deduction of transmission and distribution losses, and extra expenditure (Rs.12.96 crore) due to non-recovery of line losses.

*(Paragraphs 3.11, 3.17 and 3.15)*

Lack of internal control in adjustment of wind energy generation resulted in revenue loss of Rs.8.76 crore.

*(Paragraph 3.18)*

## **Introduction**

**3.1** The wind power programme in India was initiated towards the end of the Sixth Plan in 1983-84. As per the latest estimates, the total wind power potential in the country had been estimated to be 45,195 Mega Watt (MW) and the exploitable potential (technical potential) 14,000 MW; the share of Tamil Nadu is 3,050 MW and 1,880 MW respectively. In respect of gross potential, the State ranks seventh in the country and in technical potential, third.

Government of Tamil Nadu, realising the potential of harnessing wind energy, set up (1986) 67 wind monitoring stations, out of which 41 were identified and declared as potential sites. Only 20 sites have been exploited so far; the remaining 21 are yet to be exploited.

**3.2** Tamil Nadu Electricity Board (Board) set up (January 1986) the first demonstration windmill project at Mullakadu near Thoothukudi with 10 Wind Electric Generators (WEGs) and a capacity of 55 Kilo Watt (KW) each for generation of power. As these demonstration windmills proved successful, the Board established 109 more WEGs (between September 1986 and September 1993). The Board did not install any demonstration WEG thereafter. The total capacity of the Board's windmills as on 31 March 2005 was 19.265 MW.

Based on the good performance of these WEGs, a number of private industries situated in Tamil Nadu and other States started installing WEGs in Tamil Nadu from 1990-91. The cumulative capacity addition by private WEG promoters up to March 2005 was 2,020.96 MW, which was 99 *per cent* of the total capacity of 2,040.225 MW.

**3.3** The Board extends the following options to a private WEG promoter:

- To sell the entire wind energy power generated by him to the Board.
- To adjust the wind power energy generated with the industrial High Tension service consumption of his own or sister concern situated anywhere in the State after deducting five percent of gross power towards commission (wheeling charges). In case, the consumption in HT service was less than generation, the unadjusted power could be sold to the Board or banked for future adjustments.

**3.4** The Board is required to create/establish/enhance the infrastructure facilities (e.g. setting up of sub-stations, enhancement of power transformers, laying/strengthening of transmission lines, etc) to evacuate power generated by WEGs. The Board has been levying Infrastructure Development Charges (IDC) on the basis of the capacity of the WEG to be set up to meet the above expenditure.

### **Scope of audit**

**3.5** The Board has been purchasing power generated by the windmills from 1990-91. The purchase of wind energy power from the private WEGs by the Board and the adjustment of the same with the consumption elsewhere during the five years period ended 31 March 2005 were reviewed during December 2004 to March 2005. Audit checked the basic records of all wind farm Sub-Stations (SS) and the Electricity Distribution Circles, in which WEGs were situated.

### **Audit objectives**

**3.6** Audit was conducted with a view to ascertaining whether:

- the Board followed the general guidelines of the Central and State Governments in the creation of infrastructure facilities for planned and sustainable growth of wind energy power; and
- the Board had taken into account its financial interest also in purchasing wind energy power.

### **Audit criteria**

**3.7** Audit criteria considered for assessing the achievement of audit objectives were to examine:

- Compliance of regulations/guidelines issued by the Central and the State Governments;
- Reasonableness of various charges collected from the private WEG promoters for development of infrastructure facilities;
- Effectiveness of the internal control system for adjustment of wind energy power.

### **Audit methodology**

**3.8** The methodology adopted for attaining audit objectives with reference to audit criteria were scrutiny of:

- Guidelines issued by the Ministry of Non-conventional Energy Sources, Government of India (GOI) and Government of Tamil Nadu;
- Power Purchase Agreements (PPA) entered into by the Board with the private WEG promoters;
- Board proceedings;
- Records relating to pre/post commissioning of WEGs;
- Visit to wind farm sub-stations;

- Wind energy power generation statements;
- Purchase/adjustment of wind energy power records;
- Issue of audit enquiries;
- Interactions with the Board.

### **Audit findings**

Audit findings, as a result of test check, were reported to the Board/Government in June 2005 and discussed in the meeting of the Audit Review Committee on Public Sector Enterprises (ARCPSE) held on 8 August 2005. The meeting was attended by the Secretary, Energy Department, Government of Tamil Nadu and the Chairman of the Board. The views expressed by the members have been taken into consideration while finalising the review.

Audit findings are discussed in the succeeding paragraphs.

**3.9** The Board enters into separate Power Purchase Agreements (PPA) with each WEG promoter. Some of the common and important provisions contained in the PPA are given below:

- The power generated by the windmill is purchased at the rate of Rs.2.70 per unit on monthly basis.
- If the wind energy promoter wants to adjust the wind power generated with the consumption towards his HT service connection elsewhere in the State, five *per cent* of the gross energy generated by the windmill is deducted towards wheeling charges.
- WEG promoter has always to maintain the power factor above 0.85.
- WEG promoter has to provide two separate meters, one for export of power generated by the windmill to the grid and another for import of power from the grid.

**3.10** The details of wind energy power generated, adjusted with the consumption elsewhere in the State and purchased by the Board during the five years ended 31 March 2005 are given below:

Year	Generation	Adjusted	Purchased	Adjusted	Purchased
	(Units in lakh)			(Percentage of generation)	
2000-01	1101.26	756.21	345.05	68.67	31.33
2001-02	1,251.87	871.09	380.78	69.58	30.42
2002-03	1,283.27	878.91	404.36	68.49	31.51
2003-04	1,721.57	1,175.85	545.72	68.30	31.70
2004-05	2,544.80	1,682.65	862.15	66.12	33.88

In this regard, following deserve mention:

### **Commissioning of Wind Electric Generators**

#### ***Infrastructure Development Charges***

**3.11** The Board has been collecting Infrastructure Development Charges (IDC) from private entrepreneurs based on the capacity of WEG to be set up. IDC was revised four times between March 1993 and September 1997, but was not revised thereafter till July 2004. The Board revised the IDC from Rs.15.75 lakh per MW to Rs.25.75 lakh per MW (including Rs.0.75 lakh per MW for capacitor banks) with effect from 21 August 2004 on this being pointed out by Audit (January 2004).

Audit noticed that:

- due to delay in revising IDC, the Board could not recover Rs.18.89 crore, as computed by the Board;
- the Board fixed the recovery rate of Rs.25 lakh per MW even though it estimated an expenditure of Rs.46.06 lakh per MW. The reasons for fixing lower rate of recovery were not available on record. This resulted in short recovery of Rs.58.67 crore so far (March 2005).

The Government stated (August 2005) that the value of Rs.46.06 lakh per MW was not a realistic figure; the Board had collected Rs.24.41 crore and Rs.230 crore as IDC in 2003-04 and 2004-05 respectively but spent only Rs.9.39 crore and Rs.53 crore during the period. The reply is not acceptable in view of the fact that IDC of Rs.46.06 lakh per MW was computed by the Board as recorded in its proceeding held on 18 August 2004. Further, the expenditure stated to have been incurred did not include expenditure on transmission lines and installation of transformers. The reply is also silent about Transmission and Distribution works, which are in progress. The fact remains that there has been a short recovery of Rs.58.67 crore towards IDC from the private entrepreneurs.

#### ***Linking of WEGs to Board's grid***

**3.12** Power from wind energy is an infirm power *viz.*, its availability is not continuous. The Ministry of Non-Conventional Energy Sources, GOI had issued various instructions/guidelines from time to time (reiterated in the form of Best Practices Guidelines issued in December 2003) to ensure that the capacity growth in wind energy power is monitored, controlled and did not hamper the generation of power from other sources. These guidelines, *inter alia*, stipulated that adequate wind power evacuation facility should be provided by the utilities concerned in identified potential areas in the States and wind energy project should be commissioned only after facilities for rated capacities had been provided and the system was properly connected to the grid.

**Fixation of lower rate of recovery for Infrastructure Development Charges resulted in short recovery of Rs.58.67 crore.**

Audit noticed that:

- against the power evacuation facilities available for 1,286.050 MW in 11 out of the above 20 sites developed so far, the Board permitted commissioning of WEGs with a total capacity of 1,716.160 MW. This resulted in overloading, leading to frequent tripping of transformers and load shedding;
- in order to avoid overloading of the Shenbagaramanpudur (SR Pudur) SS, the Board decided to construct a sub-station at Sankaneri at a cost of Rs.15.07 crore. Even after commissioning (September 2004) of the Sankaneri SS, overloading of the SR Pudur SS did not come down as there was no proper power evacuation facility from the Sankaneri SS to load centres;
- in the unexploited 21 sites, though power evacuation facilities were available for 377 MW, no WEG have been commissioned so far (September 2005).

The Government stated (August 2005) that due to enormous capacity additions, the Board was unable to keep pace and provide immediate power evacuation. The wind energy development was not uniform and predictable; lead time of at least 1 ½ years was essential to develop infrastructure facilities. The Government further stated that the Board did not restrict any developer from choosing a site. This indicates that the Board did not have an appropriate, perspective policy for balanced and sustainable growth of wind energy power.

### **Purchase of wind energy power**

**3.13** Based on the suggestions of the Ministry of Non-conventional Energy Sources (MNES), the Board fixed (December 1995) the purchase price of wind energy at Rs.2.25 per unit with effect from 1 December 1995, with a provision for five *per cent* annual increase over the previous year rounded off to the nearest five paise. In 2000, the purchase price had become Rs.2.70 per unit. At this juncture, the Board reviewed the purchase price vis-a-vis the concessions extended to wind energy generators and its own financial position and decided to peg the purchase price at Rs.2.70 per unit for the subsequent five years from July 2001. The next review is due in July 2006.

Audit noticed that while suggesting the base price for wind energy power at Rs.2.25 per unit in 1995, MNES did not take into account the cost of generation, which should normally be reckoned for fixing the purchase price. Even while deciding to peg the purchase price at Rs.2.70 per unit, the Board did not consider this aspect. The financial impact, thereof, could not be ascertained in audit. In this connection, it is pertinent to note that in case of purchase of power from Independent Power Producers (IPPs), the purchase price is fixed based on the cost of generation.

**Payment for power generated by WEGs**

**3.14** While giving No Objection Certificate (NOC)/issuing taken on record letter, it is clearly stated by the Board that the WEG would be connected to the grid only on completion of permanent feeder arrangement or permanent connectivity. In order to enable a WEG promoter to avail of various tax and other benefits, the Board connects the WEG to its grid for starting and commissioning purposes only. After the trial run period, the Board would disconnect the WEG from its grid and reconnect the same to its grid only after permanent connectivity conditions are fulfilled.

**The Board paid Rs.3.20 crore for the power purchased from Wind Electric Generators, which did not have permanent connectivity with the Board's grid.**

Audit test checked 90 out of 192 and 128 out of 423 WEGs in Udumalpet and Tirunelveli divisions respectively, for which the Board gave connectivity for trial run/commissioning in March 2004 (354 WEGs) and September 2004 (261 WEGs). Audit noticed that the Board had given permanent connectivity to 191 WEGs only till March 2005 and that too, after 51 days to 10 months from the date of commissioning/trial run. For the remaining 27 WEGs, the Board had not given permanent connectivity till March 2005. The Board paid Rs.3.20 crore to the promoters of these 27 WEGs for the power generated by them. It was also noticed that the Board did not maintain proper records to indicate that the power generated by these WEGs was actually received by the Board.

The Government stated (August 2005) that the tie-up approvals were given either as temporary or permanent, depending upon the availability of power evacuation facilities and the possible wind generation. The reply is not acceptable in view of the fact that MNES guidelines clearly stipulate that WEGs should be connected to the grid only after permanent evacuation facilities were made available in accordance with the clause in the PPA.

**Non-deduction for line loss**

**3.15** In respect of those WEG developers, who opt to sell the entire wind power generated by them to the Board, it pays for the power based on the meter readings taken at the WEG end. No deduction towards line loss in the interfacing line is made. Audit analysis of the meter readings taken by the Board at the WEG end and at the SS end (which are connected by 11/22 KV dedicated feeders) during 2000-2005, revealed that the reading at the SS end was always less than the reading at the WEG end. The average difference between these two points was 3.68 *per cent* of the reading at the SS end.

**Failure to deduct for line loss on purchase of wind energy power resulted in extra expenditure of Rs.12.96 crore.**

Audit noticed that in the case of co-generation power and captive power generation, two *per cent* of the energy sold to the Board is deducted towards line loss. Hence, the Board should have deducted at least two *per cent* of the wind energy power sold to the Board towards line loss as in the case of co-generation and captive power generation plants. Failure to do so resulted in avoidable extra expenditure of Rs.12.96 crore during the five years ended 31 March 2005.

The Government stated (August 2005) that as several windmills were connected to each feeder it was not possible to calculate the individual loss for

each windmill. The reply is not acceptable as there is line loss in the interfacing line and two *per cent* is deducted as line loss in respect of power purchased from co-generation and captive power plants.

***Absence of provision to disconnect idle WEGs***

**3.16** Audit scrutiny of WEGs lying idle for more than 12 months as on 31 March 2005 revealed that 141 WEGs with a total capacity of 36.86 MW were not running for periods ranging from 12 to 116 months in Tirunelveli and Udumalpet divisions. Further test check revealed that in Vadakkankulam and Perungudi wind farm sub-stations, 13 WEGs with a capacity of 3.700 MW were not running; while in the same sub-stations applications for commissioning from 18 WEG promoters with a total capacity of 13.850 MW were pending. As there was no clause in the PPA to disconnect WEGs that were remaining idle for long periods, the Board could not effectively utilise the power evacuation facilities available.

The Government agreed (August 2005) that the Board was not empowered to disconnect the services as there was no such provision in the PPA.

**Adjustment of wind energy against consumption**

***Transmission and distribution loss***

**3.17** The Board in the initial stages considered installation of windmill similar to setting up of captive diesel generating set in a factory premise. The transfer of energy from the windmill to the place, where the developers require power, was considered to be “displacement” and therefore, no reduction towards line losses on transmission was made. After deducting two *per cent* of the energy generated towards commission, the balance energy was made available to WEG developer for adjustment. This commission was increased to five *per cent* with effect from 27 September 2001, after a lapse of 15 years and there had been no further increase till date (September 2005).

There has been huge increase both in the installed capacity of private WEGs and power generated by them. By the end of 2004-05, the installed capacity was 2,020.96 MW and wind power generation was 2,544.80 Million Units (MUs). In view of this, the concept of treating transfer of power as “displacement” was no longer relevant. The Board should have considered levying wheeling charges of at least 15 *per cent*, which was being charged in such cases from other sources like co-generation and captive power generation. Failure to do so resulted in revenue loss of Rs.204.87 crore during the five years period ended 31 March 2005.

**Non-deduction for transmission and distribution losses on adjustment of wind energy power led to revenue loss of Rs.204.87 crore.**

The Government agreed (August 2005) that the line loss up to 11 KV level might be about 10 *per cent* and further stated that in order to encourage Non-Conventional Energy Sources, wheeling charges were levied at five *per cent* according to the guidelines of MNES. The reply is not acceptable in view of



the fact that there are no MNES guidelines in this regard. Further, 15 per cent wheeling charges are being levied in respect of purchase of power from other sources.

### ***Internal control system***

**3.18** For the adjustment of wind power energy generated by the WEG, meter readings of the power generation are taken by the Assistant Executive Engineer and details are forwarded to the circles, where the adjustment is carried out. Audit noticed that:

**Absence of effective Internal Control System in adjustment of wind energy power led to revenue loss of Rs.8.76 crore.**

- in 22 cases, the adjustment was effected for the WEG power in excess of the quantum of power wheeled by them, resulting in revenue loss of Rs.8.76 crore.
- in three cases, the WEG power valuing Rs.3.54 crore was adjusted against the consumption of three HT services although this wind power was stated to be generated in circles where there were no windmills.

These cases show that there was no effective internal control system to ensure the proper adjustment of power.

While accepting the audit observations, the Government replied (August 2005) that steps were being taken to provide remote meters and send the readings through e-mail and further to computerise the entire wheeling/banking procedure.

### ***Undue benefit to WEGs***

**3.19** WEGs being inductive in nature, draw reactive power from the grid to which they are connected. When WEGs draw more reactive power, the voltage level of the grid falls to low levels. The drawal of reactive power if not controlled, results not only in poor quality of power supplied (due to grid disturbance) but also endangers the safety of the grid.

In order to partially compensate the Board from the drawal of excessive reactive power by WEGs, compensation charges at the rate of 10 paise per unit of reactive power drawn by WEGs was levied (June 1995). This was enhanced to 30 paise per unit in October 1999 and further enhanced to Rupee one per unit in April 2000. Aggrieved by this enhancement, the WEG promoters filed (November 2000) a writ petition challenging the enhancement in the High Court, Chennai.

The Court, while upholding the enhancement of compensation charges, directed that the enhancement from 30 paise per unit to Rupee one per unit of reactive power drawn by WEGs would be made applicable only to those WEG promoters who did not maintain the Power Factor (PF) of 0.85 to 1.00. The Board, however, did not issue any amendment to this effect.

On the other hand, the Board divided (November 2002) those WEGs, who did not maintain the PF of 0.85 to 1.00, into two categories viz., partially erring

WEGs (who draw reactive power up to 10 *per cent* of power exported) and erring (those who draw reactive power more than 10 *per cent* of power exported). The compensation charges fixed for erring members was Rupee one per unit and for partially erring members, it was 30 paise per unit of reactive power drawn.

The action of dividing the erring WEGs into two categories was neither contemplated by the Board earlier nor warranted by the Court judgement. This resulted in an undue benefit of Rs.10.78 crore to those WEGs, who did not maintain PF of 0.85 to 1.00, but drew reactive power up to 10 *per cent* of power exported, during the four years ended 31 March 2005.

The Government stated (August 2005) that the Board's aim was to curb drawal of reactive power by offering some type of incentive to the WEG promoters, who had reduced reactive power drawal. The reply is not acceptable in view of the fact that the Court's directive to levy/enhance the compensation charges to the WEG promoters who did not maintain the PF of 0.85 to 1.00, was not complied with. The fact remains that not invoking the Court judgement in the proper spirit, has resulted in undue benefit of Rs.10.78 crore to partially erring WEG promoters, as categorised by the Board.

### **Conclusion**

**The private wind energy generators accounted for 99 *per cent* of the total installed capacity of wind energy in the State as on 31 March 2005. The Board failed to carry out balanced development of all the identified potential sites, resulting in imbalance in the generation and evacuation facilities in some areas. The recovery of Infrastructure Development Charges from the wind energy generators to create/establish/enhance evacuation facilities was not adequate. The Board failed to recover line loss and distribution loss incurred by it on the evacuation of power from wind energy generators, as was being done in respect of other co-generation, captive power plants and independent power producers. Internal control in respect of adjustment of wind energy generation was found to be deficient.**

### **Recommendations**

- **Steps should be taken to develop all the potential sites to correct the imbalance between generation and evacuation facilities.**
- **The Board should ensure that recovery of Infrastructure Development Charges matches the expenditure incurred on this.**
- **Line and distribution loss from the wind energy generators should be recovered as is being done from other power producers.**
- **The Board should strengthen internal control systems in respect of adjustment of wind energy generation.**